BEYOND CLOSURE:

STEWARDSHIP AT ROCKY FLATS

by the Rocky Flats Stewardship Dialogue Planning Group

April, 1999

Convened by

The Rocky Flats Local Impacts Initiative

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EXECUTIVE SUMMARY

Stewardship of the Rocky Flats Environmental Technology Site is presented in this document as accepting responsibility for and carrying out remediation activities that will ensure the *long-term* protection of human health and of the environment from the hazards posed by residual radioactive and chemically hazardous materials. It is a complex subject whose technical, regulatory, and institutional dimensions are explored in depth. We explore *how* stewardship of Rocky Flats can be carried out rather than the specifics of *what* stewards of the Site must do. *Who* stewards are is discussed as well. This document is written for those who are concerned about addressing the technical, regulatory, and social issues related to long-term care of Rocky Flats.

The Rocky Flats Stewardship Dialogue Planning Group (DPG) brought together the thinking and research forming the basis of this paper. The Rocky Flats Local Impacts Initiative (RFLII) convened the DPG in January 1998 to plan a public dialogue involving long-term site stewardship as it applies to the Rocky Flats Environmental Technology Site (RFETS, or the Site). DPG participants included representatives from the community, state and federal agencies, and local governments. (Please refer to Appendix A for a complete list.)

Some decisions affecting stewardship have already been made. Others will be made relatively soon, as the expedited cleanup schedule includes several environmental remediation choices in the next two to three years. These near-term choices shape the type and nature of long-term stewardship needed at the Site, which will in turn affect future use options. The DPG presents this paper to support this cooperative, informed decision-making, in the context of a common understanding of stewardship.

Becoming educated about stewardship issues is the most critical step in becoming involved. The White Paper is intended to create a common language and level of knowledge to support responsible decision-making by those who feel they have a stake in Rocky Flats' future – both near and distant. It provides a brief history of RFETS and the players involved in and concerned about use and care of the site; discusses what stewardship means; and then details the following four issue areas:

- regulatory requirements and binding agreements related to cleanup,
- institutional controls for protection and local government's planning tools for land use,
- engineered controls for protection, and
- ongoing and long-term information needs.

The DPG members believe that RFETS stewardship is important to the community and region. We encourage those concerned about Rocky Flats to become actively involved in the dialogue, and to identify constructive strategies within each steward's area of influence which incorporate stewardship principles into decision-making processes, closure actions, and long-term planning.

Beyond Closure

1.0 INTRODUCTION

Can you find the city Çatal Huyuk on a map? Even if you know it's in Turkey, and you know the countryside well you may not be able to find it. It's one of the first cities built by humans – over 6,000 years ago – and is in total ruins now, not even recovered. Their long-dead script is an indecipherable cuneiform. Even if the ancient Çatal Huyukans had wanted to communicate something to the future, we probably are not getting the message.

Taking a lesson from the past, the Rocky Flats Stewardship Dialogue Planning Group (DPG) is asking questions such as:

- How do you plan to protect human health and the environment on a piece of land that may have levels of radioactivity that could last for at least 24,000 years?
- What mechanisms might possibly assure environmental protection into such a distant future?
- How should we communicate risk and safety messages to far-off generations?
- Where will the continued funding needed to maintain containment systems come from, in perpetuity?

This document, like the DPG participants, does not provide specific, final answers to the long-range problems caused by contamination, but rather frames the critical issues and concerns which must be understood to undertake stewardship of the Rocky Flats Site in an informed manner. Stewardship is defined here as *accepting responsibility for and implementing activities necessary to maintain long-term protection of human health and of the environment from the hazards posed by residual radioactive and chemically hazardous materials*[1].

Stewardship is also referred to more broadly as the fulfillment of our obligations to the cleanup of the environment. The definitions of what these obligations are, how they are fulfilled, by whom, and when, are immediately and legitimately complicated by the variety of interests in the community. Further, the issues of stewardship are not solely legal, technical, or economic ones, but also speak to the ethics and values of the community. Deeply held and differing views on the Site's end-state and responsibility for achieving and maintaining that end-state will shape the process of coming to community agreement on issues of stewardship of the Site. This document seeks to convey the understanding that stewardship of Rocky Flats means not simply ensuring compliance with current laws but making decisions in the context of our broad and binding ethical and historical relationship to the Rocky Flats environment.

Developing a long-term stewardship program for RFETS will be a highly complex planning process involving technical, legal, logistical, community involvement, administrative, fiscal, ethical, and political components that must all be balanced appropriately. Those who seek to contribute constructively to the ongoing stewardship dialogue must be familiar with the general characteristics, feasibility, and limitations of those components. A community dialogue – and subsequent decisions – on stewardship will embrace technical, engineering, moral, and emotional

The primary purpose of this document is to describe aspects of stewardship in an informative manner.

considerations. To be productive, this dialogue will demand from its participants openness and understanding of these considerations, and the viewpoints of all those involved. The primary purpose of this document is to educate interested parties, creating a starting point for an informed dialogue based on a common understanding of the basic issues.

A complete long-term site stewardship program may utilize a variety of possible tools:

- site monitoring and surveillance,
- institutional controls such as easements or other legal tools to restrict land use,
- engineered controls,
- site information databases, and
- regulatory agreements.

The large-scale remediation efforts mandated under the Rocky Flats Cleanup Agreement (RFCA) will influence the broader stewardship vision or strategy. These remediation efforts in effect become the tools of stewardship. The tools chosen under RFCA do not preclude the possibility of further cleanup – more advanced stewardship – if improved technologies become available, but are chosen now because they can provide a significant degree of protection until natural attenuation or further cleanup eliminate risks posed by residual hazards.

This paper discusses the current information known about these tools, as a precursor to detailed stewardship decision-making on the part of responsible and concerned parties. Participation in the stewardship dialogue can be a way for the community to influence what remediation efforts are chosen, who is involved, and how stewardship is carried out. It should be noted that this paper represents the findings and thoughts of a group of 12 committed individuals, not the point of view of one individual or institution.

Background. Used as a site for the production of nuclear weapons components for most of the latter half of the 20th century, Rocky Flats was placed on the CERCLA National Priorities List in 1989 due to serious contamination of the site's soil and groundwater. In 1994 the primary mission of the Rocky Flats Environmental Technology Site (RFETS, or the Site) became cleanup and remediation, to achieve acceptable levels of protection of human health and the environment. Long-term stewardship is a vital component of the overall mission. The Dialogue Planning Group convened in January 1998 to plan a public dialogue on long-term Site stewardship. Comprised of representatives from federal and state agencies, local governments, the Rocky Flats Local Impacts Initiative (RFLII), and the Rocky Flats Citizens Advisory Board (CAB), the DPG has identified four key issue areas which must be addressed to assure long-term health and safety at the Site: regulatory requirements, institutional controls, engineered controls, and informational needs.

2.0 STEWARDSHIP OF ROCKY FLATS: FRAMING THE DISCUSSION

2.1 Site Overview

The Rocky Flats Site is located approximately 15 miles northwest of Denver, Colorado. (Refer to Figure 1 for regional context.) Construction of the site began in 1951. From 1952 to 1989, the site's primary mission was to produce nuclear weapons components and assemblies manufactured from uranium, plutonium, beryllium, stainless steel, and other metals. Production activities included metalworking, component fabrication and assembly, and plutonium recovery and purification. To support these missions, the site also conducted research and development in the fields of chemistry, metallurgy, materials technology, nuclear safety, and mechanical engineering.

In 1989, many of the site's nuclear production functions were suspended after a safety review temporarily shut down plutonium operations. Also in 1989, Rocky Flats was placed on National Priorities List, under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Following an extensive review, limited plutonium production activities resumed until January 1992, when all nuclear production terminated. Since October 1994, when the remaining non-nuclear activities ceased, the site's primary mission has been cleanup and remediation.

Facilities at the site are located on 384 acres (the Industrial Area) surrounded by 5,878 acres of undeveloped high prairie terrain (the Buffer Zone). Production activities at the site resulted in the contamination of buildings and environmental media with chemical and radioactive substances. In addition, large quantities of plutonium in residues, transuranic waste, and other radioactive and hazardous wastes remain stored onsite. The greatest contamination is adjacent to the Industrial Area. While portions of the Buffer Zone – most notably the Walnut Creek and Woman Creek drainages and the 903 pad plume – have some levels of contamination, large portions of the Buffer Zone already meet standards for unrestricted use without additional cleanup.

2.2 Stewardship Considerations: What and Who

The issues of stewardship are not simply legal, technical or economic ones, but also speak to the ethics and values of the community.

The challenge of planning, implementing, and maintaining a post-cleanup stewardship program at a site with residual radionuclide contamination is particularly daunting. Plutonium-239, the primary radioactive contaminant of concern at Rocky Flats, has a half-life of 24,360 years. Residual levels of Pu-239 may require a stewardship timeline measured in centuries, if not millennia. Selecting the proper stewardship tools, adequately implementing them in a protective manner, and preserving their effectiveness over great spans of time are all crucial aspects of a successful long-term stewardship program.

An important aspect of the stewardship discussion is site "end-state," or the condition of the site following completion of the remediation and closure activities stipulated in the Rocky Flats Cleanup Agreement. Achieving and maintaining an acceptable end-state at Rocky Flats requires engineering solutions to remove nuclear material and remove or contain environmental contamination. Obviously, engineering solutions cost money, and many of the practical conversations regarding stewardship at Rocky Flats will revolve around the expense of various

solutions. Choices regarding many individual environmental restoration projects can boil down to a trade-off between the short-term expense of removal and disposal and the long-term outlay involved in maintaining and monitoring the performance of engineered barriers ("caps"). Both approaches have inherent advantages and disadvantages, and both will fundamentally shape the end-state of RFETS and the subsequent ongoing activities possible on the Rocky Flats land.

The choice between removing or managing environmental contamination at Rocky Flats introduces the choice between surety and some degree of uncertainty, at least from an engineering perspective. The removal of contaminated material and disposal at some place far away makes it reasonably certain that those contaminants will no longer pose any threat to the community around Rocky Flats (the risk has not disappeared altogether, but rather has been removed to a more suitable place). Leaving contaminants in place, and using engineered systems to contain or treat them, introduces questions about the long-term reliability of these systems.

The use of long-term controls introduces another question, that of the reliability of the institutions charged with managing them. This is not to impugn the integrity of persons representing such institutions (namely, federal, state, and local governments) nor the institutions themselves. However, if remedies are put into place that rely on sustained funding for their continued operation, a legitimate issue arises as to where this funding will come from, and what will be the effects on the environment if the funding were to stop? Again, implementing long-term solutions that rely on continuing funding that is not or cannot be guaranteed may be perfectly reasonable considering the situation at hand. However, it is a consideration that cannot be dismissed from the stewardship conversation.

Who are stewards? A definition of who stewards are was developed at another DOE facility facing similar questions.

> Stewards are individuals or groups responsible for stewardship activities and protection of human health and the environment. Many stewardship functions can be carried out by existing organizations. However, if no existing organization can perform a necessary function, a new organization must be developed. When more than one steward is involved, coordination is required to avoid unnecessary conflict and duplication of effort, but some redundancy of responsibilities is desirable. Stewards can be categorized as principal steward, implementation stewards, and oversight stewards.
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> - **The principal steward** has legal responsibility for contaminated land and facilities including the financial obligation to ensure adequate funding for stewardship, and to take corrective action if the stewardship program becomes ineffective.
> - **Implementation stewards** are responsible for stewardship activities; examples of such activities are contracting for remediation, monitoring, maintenance, and record keeping.
> - **Oversight stewards** ensure that the goals and requirements of a stewardship program are met.

Specific roles of stewards depend on the design of a stewardship program. Illustrative examples follow:

- **Federal government.** Because contamination at DOE facilities results from federal government activities and because the federal government is legally responsible for cleanup, the federal government is considered to be the principal steward. The federal government is also likely to be responsible for implementation of a stewardship program, including record keeping.
- **State government.** States are oversight stewards, and can be implementation stewards.
- **Local government.** Local entities such as planning commissions and registers of deeds are important implementation stewards, as are schools and libraries. Local governments also fulfill an oversight role.
- **Stakeholders.** Public stakeholders fulfill an oversight role by helping to ensure that stewardship programs and activities continue to be appropriate.[2]

2.3 Roles of the Principal Participants

The specific *dramatis personae* at Rocky Flats are as follows.

Department of Energy. The DOE Rocky Flats Field Office (RFFO) is the lead DOE organization for future use planning efforts. The Field Office manages the public involvement process, has co-chaired the Industrial Area Transition Task Force, and has and is responsible for development of all decision documents pursuant to RFCA.

Citizens Advisory Board. DOE, EPA, and the State of Colorado established the Rocky Flats CAB in 1993. It is comprised of up to 30 individuals representing diverse views and interests from the communities around Rocky Flats and includes representatives from academic institutions, the business community, environmental organizations, local governments, the health industry, the Rocky Flats workforce, and public interest groups. CAB recommendations are presented to DOE, CDPHE, and EPA. The agencies consider this advice as part of their decision-making process, and are expected to respond to the CAB as to how its advice was incorporated, or why it was not.

RFLII and other Stakeholders. Stakeholders have participated in all major future use initiatives through the Future Site Use Working Group (FSUWG), the CAB, RFLII, and groups such as the IATTF. RFLII, operating from 1992 to 1999, and designated by DOE as the Community Reuse Organization, was composed of representatives of local governments, businesses, civic groups, labor unions, site workers, local landowners, and other citizens. RFLII and DOE jointly convened and chaired both the Industrial Area Transition Task Force and the Stewardship Dialogue Planning Group to address long-term stewardship issues.

Regulators. The two main regulatory agencies, EPA and CDPHE, have participated directly in future use initiatives (e.g., the FSUWG and the IATTF) and indirectly via their responsibilities under RFCA. EPA oversees the Buffer Zone cleanup and CDPHE oversees the Industrial Area cleanup.

Rocky Flats Coalition of Local Governments. Seven local governments adjacent to or owning land adjacent to RFETS, including Jefferson and Boulder Counties, the Cities of Arvada, Broomfield, Boulder, Westminster, and the Town of Superior, have formed an intergovernmental organization named the Rocky Flats Coalition of Local Governments. The Coalition's mission is to:

- serve as a watchdog for Rocky Flats environmental cleanup activities,
- coordinate with local, state, and federal agencies,
- advocate for Coalition policies,
- plan for long-term protection of public health and the environment after cleanup,
- preserve the Rocky Flats Buffer Zone as open space, and
- provide input on future use of Rocky Flats as it relates to cleanup activities.

The Coalition expects to succeed RFLII as the Community Reuse Organization.

Integrating Contractor. Kaiser-Hill, LLC won a five-year contract as the integrating contractor at Rocky Flats in 1995. Its team of Rocky Mountain Remediation Services, Safe Sites of Colorado, Wackenhut, and Closure Support Services carry out the operations and closure activities at the Site. There is no decision on retention of Kaiser-Hill by DOE, as of this publication date.

Natural Resource Trustees. RFCA establishes a procedure for DOE to consult with state and federal natural resource management agencies to assure that remediation activities minimize or mitigate potential damage to natural resources.

2.4 Public Dialogue on Stewardship

"Make it Safe, Clean it Up, Close it Down." Since the 1995 Rocky Flats Summit, this has been the accepted Vision for Rocky Flats. As required by the Rocky Flats Cleanup Agreement, each discrete cleanup activity, such as removing gloveboxes from former plutonium building or removing contaminants from a former disposal trench, has a public review process. However, what has been missing is a broad and public discussion of the policies and strategies that will guide the closure of the Site and post-closure years at Rocky Flats. If each cleanup action is discussed and implemented in isolation, there will be no overall stewardship strategy articulated, and our stewardship of RFETS will merely be discerned after the fact rather than being created. intentionally to serve as a guidepost. The goal should be to achieve informed community consent, not only for the Vision, but also for the general strategies to achieve the Vision in the longest-term view possible.

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In this context, the Site and its regulators should continue to educate the general public about the overall Vision and the types of activities they anticipate in order to "Make it Safe, Clean it

Up, Close it Down." In addition, citizens – both those traditionally involved such as local officials, the Citizens Advisory Board, chambers of commerce, advocacy or activist groups, and neighbors, as well as those with an interest or expertise who may not have been previously involved – should be consulted and recruited to help formulate these broad policies. Within the next two to three years we need to have a much clearer idea of the desired end-state and attendant stewardship implications, to avoid piecemeal decisions and confusion around lines of responsibilities.

The dialogue should not ignore the significant ethical, moral, aesthetic, and even emotional dimensions of stewardship facing us. For example, a regulator may be choosing between two equally viable environmental remediation controls. Aesthetic or ethical considerations, based in community values, should be brought into play in weighing such a decision.

Considering our obligations to the environment and future human generations, especially at and around Rocky Flats, introduces a question of justice: "What's the right thing to do?" We can expect that some parties will continue to demand a complete cleanup of Rocky Flats, leaving no residual contamination in place – a demand that is based not solely on risk, but on the belief that the government has a moral obligation to clean up all that has been contaminated. Countering this, others in the community may argue that leaving some contamination at Rocky Flats, along with some small risk, is reasonable given the benefits that the site has brought to the community and to the defense of the nation. A further argument is that currently there is no cost-effective technology to achieve complete cleanup, and the geometrically incremental extra cost of turning a manageable risk into no risk might be better used for other purposes.

"What's the right thing to do?"

2.5 Site Remediation and Care Issues

In the next two years, the Department of Energy (DOE), its contractor, the regulators, and the community will discuss the following site management issues to assist in choosing remedies. The outcome of these discussions should be a set of policies and strategies for each issue that will guide site-wide planning and decision-making in the next decade. These strategies and policies will help define the structure and characteristics of a long-term post-closure stewardship program for the Rocky Flats Site.

- Long-term monitored and retrievable **storage of Pu** and transuranic wastes if receiver sites do not materialize.
- **Industrial Area environmental restoration**, including action levels and disposition of building rubble, groundwater, disposition of building foundations and unneeded infrastructure, design and location of caps.
- **Surface water**, including ponds management, **remediation** of riparian areas, preservation of habitat, and monitoring protocols.
- **Buffer Zone protection as open space**, including interim management of plant and animal habitats, weed control, natural resource damages, and identification of desired post-cleanup uses.

This white paper advocates getting consensus on stewardship strategies <u>before</u> final decisions are made on storage, restoration, remediation, retention of information, implementation responsibility, maintenance of engineered controls, liability if controls fail, long-term funding, and other issues.

- **Soil and water cleanup standards** based on improved knowledge about computer modeling, risk assessment, and actinide migration.
- As cleanup proceeds, **policies and strategies** will also need to be developed for the retention of information and records; responsibility for implementation; monitoring and repairs of engineered controls; liability if controls fail; and adequate funding for long-term protection of public health and the environment.

Decisions will be made on all of these issues, whether or not there is an overall stewardship strategy. For example, if a decision is made to leave some contamination in place, contained with a cap, this becomes a de facto stewardship decision because the cap will require long-term monitoring and maintenance. This paper advocates getting a clearer understanding of the implications for stewardship actions before such decisions are made.

2.6 Stewards in the Neighborhood: Local Development Plans

The governments of Broomfield, Westminster, Arvada, Boulder, Superior, and Boulder and Jefferson Counties, as well as various Parks and Recreation and Fire Districts hold jurisdiction over lands contiguous with RFETS. These communities and their citizens will be key players in shaping stewardship decisions.

At present they hold a range of viewpoints regarding their anticipated land-use and community development relationship with the Site. There are a variety of sub-regional community development goals that will serve as a backdrop to stewardship discussions, summarized below. It is critical to understand these potential land uses when considering the long-term stewardship strategies. Note that near-term land use directions anticipated in 1999 are linked to the presently robust Rocky Mountain economy – a state that we cannot assume will continue forever.

Residential Development. Residential development goals vary between communities, depending on "growth" preferences of their citizens. During this period of economic well-being and because of the rapidly expanding job opportunities here, the Northwest Denver metro area remains a preferred location for new home buyers. It is likely that residential developers will continue to pursue new housing projects on land near the Site, and therefore Rocky Flats land will continue to come under increasing scrutiny, as the nearby population grows.

Industrial/Commercial Development. The counties surrounding Rocky Flats are a preferred choice for relocation of new and growing firms in the fields of technology and information. Adjacent communities promote varying levels of targeted commercial development in the vicinity of the Site. Projects in existence, expanding or under planning, include Interlocken Business Park, Jefferson Center, West More, FlatIrons Crossing, and the U.S. 36 Technology Corridor. The Northwest metro communities will continue to compete to attract high-paying, environmentally safe new jobs. Future discussions about reuse of the Industrial Area will occur in the context of these market forces as well as the proximity of the Industrial Area to the regional Open Space network.

Open Space/Trails Development. Adjacent communities have developed some of the most extensive, well-maintained, and heavily used open space and trail systems along the Front Range. Through taxing powers, zoning authority, and property acquisition programs, as well as by popular demand, the open space and trails network in the Northwest metro area is rapidly growing. Rocky Flats could play an important "connector" role in this expanding network.

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Insert map here

Transportation Development. In the Northwest area of the Denver metro area, communities continue to improve inter-city transportation, including east-west and north-south access. The four principal roads bordering the Site (Highways 93, 128, 72, and Indiana Avenue) will continue to be scrutinized for potential expansion or safety improvements in order to achieve improved regional and suburb-to-suburb access. Jefferson County is undertaking a comprehensive review of transportation in the area, including a feasibility study of the Jefferson County segment of the Northwest Parkway. Transportation planning in the area could significantly impact access to, potential redevelopment of, and open space preservation of the Site.

Water and Sewer. Broomfield and Westminster are the principal downstream recipients of the two water drainages running through the Site. Broomfield will use Great Western Reservoir for distribution of effluent "reuse water" for area parks, open space, and golf courses. Westminster, Thornton, and Northglenn will rely on Standley Lake for provision of drinking water supplies. Long-term oversight of Site water management programs will likely include an ongoing relationship with Broomfield, Westminster, and other communities with water management needs.

Community Buffers. Suburban communities struggle to maintain visual and geographic buffers between each other. Broomfield, Lafayette, Boulder, and others have signed intergovernmental agreements to maintain community buffers and greenbelts. Long-standing discussions continue about maintaining a Front Range "backdrop" adjacent to the Site.

3.0 SETTING THE STAGE: DECISIONS IMPACTING STEWARDSHIP

Stewardship must be framed in the context of the decisions made and actions taken to date regarding remediation at the Site. This section provides an overview of the status of such actions and discusses stewardship in light of those actions.

3.1 Milestone Decisions in the 1990s

Future use planning at Rocky Flats began in **1994** when RFLII formed the **Rocky Flats Future Site Use Working Group** (FSUWG) to carry out DOE's land use and facility reuse initiative for the site and to determine stakeholder-preferred future use options for the site. The FSUWG, representing a broad spectrum of interests and stakeholders, issued its recommendations as input in the development of the Vision and Preamble to RFCA, and the three primary recommendations were incorporated into RFCA:

1. the Buffer Zone should be preserved and managed as open space;
2. the Industrial Area should be cleaned up to support use as an employment center; and
3. further cleanup should occur as improved technologies allow, with an ultimate goal of clean up to background levels.

DOE used these recommendations when creating the closure project goals for cleanup.

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In **July 1996**, DOE, the Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE) entered into the **Rocky Flats Cleanup Agreement** (RFCA). The RFCA establishes the regulatory guidelines and framework for achieving site cleanup and coordinates the statutory compliance obligations under CERCLA, the Resource Conservation and Recovery Act (RCRA), and the Colorado Hazardous Waste Act (CHWA) into a single regulatory document. RFCA also recognizes the legal authority of local governments to regulate future land use at and near the site. (See Glossary and acronym list in Appendix C.)

RFCA divides the site into two operable units: the Buffer Zone and the Industrial Area (see map on p. 12 and further discussion below). Because of long-term uncertainties associated with budget allocations and the potential development of new technologies, RFCA is focused on achieving an intermediate end-state, where major cleanup is completed and urgent risks to human health and the environment are reduced first. RFCA sets the benchmark for achieving this intermediate cleanup state by establishing standards for removal or containment of contaminants in soils, surface water, and groundwater based on anticipated future uses. These standards are referred to as the cleanup action levels. According to the RFCA Preamble, planned cleanup levels will permit open space use of the Buffer Zone, and the Industrial Area cleanup levels will permit open space and/or industrial reuse. It should be recognized that when the final Corrective Action Decision (CAD)/Record of Decision (ROD) for RFETS is issued the site will be "clean" in accordance with CERCLA, RCRA, and CHWA requirements; it will be implicitly acknowledged that there are opportunities for a future end-state that is even "cleaner."

In **1997**, DOE and RFLII jointly convened and chaired the **Industrial Area Transition Task Force** (IATTF) composed of local government officials and other stakeholders, to evaluate potential future uses of the Industrial Area and whether existing buildings and infrastructure should be preserved. Consensus recommendations, released in **September 1998**, included:

1. supporting RFCA requirements to remediate the Industrial Area to a standard suitable for a future employment center regardless of other potential uses;
2. decontamination, demolition, and removal of all facilities and infrastructure (not just contaminated portions) as part of the Closure Project;
3. planning and implementing closure and any future missions to ensure preservation of future options and benefits to the community; and
4. using containment strategies (e.g., covers, caps) only where sufficient technology does not exist to remediate sufficiently to ensure acceptable risk, not just to save money.

In **June 1998**, the Rocky Flats **Citizens Advisory Board** (CAB) endorsed the 1995 FSUWG report and provided its own future use recommendations:

1. the site end-state should be open space, with the specific type of open space determined in the future when final site conditions are more defined;
2. all buildings should be demolished and no new development or redevelopment should take place anywhere on the site; and

3. the agencies should initiate comprehensive public education and involvement to determine the public's vision of the site's end-state before a specific type of open space is determined.

The **Natural Resource Management Policy**, a RFCA requirement, provides a policy for managing the Buffer Zone while the site is being cleaned up. The draft policy received public comment, and the final document was released in **September 1998**.

Site disposition (i.e., the transfer of any remaining facilities and lands to another entity) will require an analysis under the National Environmental Policy Act (NEPA). This analysis could require as much as three years to complete and could start as early as **2002**. Appendix E provides more detail on this.

All site remedial actions are being conducted under the RFCA framework. Currently **closure** is scheduled for completion in **2010**, with a goal of **accelerated closure by 2006**, to achieve the intermediate end state.

Finally, the Rocky Flats Coalition of Local Governments is getting underway in the Spring of 1999.

3.2 Intermediate End-State Objectives and Time Horizon

For planning purposes, the Rocky Flats closure plan, as defined in RFCA, assumes the following as the "clean" intermediate end-state objectives to be achieved by 2010 at the latest and as early as 2006:

- About 300 acres of the Industrial Area will be available and suitable for light industrial reuse and/or open space.
- Less than 100 acres of the Industrial Area will be capped with access restrictions and institutional controls.
- The Buffer Zone's 5,900 acres will be reused as open space.
- All surface water onsite and groundwater in the outer buffer zone, and all surface water and groundwater leaving the site will be safe for any and all uses.
- Long-term monitoring and institutional controls will be established.

Specific future, post-closure land uses will evolve in consultation with stakeholders as more is known about both the disposition of waste and materials and the nature and extent of remedial actions. Additional cleanup and removal activities could be conducted in the long term as funding and new technologies allow.

3.3 Stewardship and Land Use: An Interdependent Relationship

The DPG recognizes that there are other long-term responsibilities beyond those spelled out in RFCA. This understanding is at the heart of defining and integrating

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stewardship principles into the remediation process at the Site. All stewards must consider stewardship actions in every decision and choice concerning environmental restoration. In fact, it can be said that all we're doing right now in our stewardship work is selecting a future exposure scenario.

Stewardship choices happen in both the closure and post-closure period. This section discusses stewardship issues for the relatively near-term (defined as 8 to 15 years). Stewardship issues for the very long term (tens of thousands of years from now) have a different set of concerns and implications. The DOE has addressed strategies for communicating information about hazardous materials sites across long time spans in several publications.[3]

Present-day cleanup planning should be an iterative process to best serve long-term stewardship and land use needs. The methods and reliability of post-cleanup stewardship need to be factored in to decisions and choices made during cleanup work. On the one hand, knowledge of the long-term stewardship program helps in making informed, present-day land use decisions. On the other hand, desired future land uses form an important part of the basis for present-day decisions regarding cleanup and the resultant types of stewardship. An understanding of the limitations to our ability to be stewards may help in present-day land use decisions. Some illustrations of this interdependent relationship include:

Residual Contamination. If a parcel cannot be remediated sufficiently to achieve acceptable levels of risk for humans and the environment, the nature and extent of residual contamination must be documented. Any uses of the land for which the contamination would pose unacceptable risks must be prevented. Future stewardship must include communicating those risks to potential users, as well as monitoring of potential migration of contaminants. For example, the 100 acres in the Industrial Area will fall in this category; this land is assumed to require capping.

Physical Controls. If active controls such as fences or caps are chosen in order to limit future risks, the future land uses must assure their ongoing success. Types and requirements of physical controls must be accounted for during the selection of future uses. And, there must be concomitant organizational structures that hold responsibility for ongoing operation and maintenance related to those controls. The limits and powers of such organizations should be considered in choosing physical controls.

Institutional Controls. Some post-cleanup land use controls may require administrative implementation such as deed restrictions or covenants. In this case, the community may choose additional limits on future use options – such as public ownership – that take into account the uncertainties of knowledge and enforcement of private mechanisms. In other words, a site may be considered safe enough for a particular use but the community may choose to preclude it due to the possibility that proper controls could not be sustained.

Monitoring and Surveillance. A stewardship program may contain provisions that soil, air, and water be periodically monitored to assure contamination does not migrate or to document

the extent of migration. Access to and maintenance of these monitors must be provided for in future use and stewardship plans.

Risk Assessment. A key element of remedy planning under RFCA is that the land after cleanup must be suitable for a "reasonably anticipated future use." In some cases it is reasonable to simply determine a desired use and clean up to the levels mandated by that use. At RFETS, cleanup of the entire Site to allow for unrestricted use is presently not thought to be feasible due to several serious variables: cost, lack of technology, worker and public health risks, potential ecological damage, and political difficulties.

Therefore, a balance must be found between present remediation actions, cost, desired future uses, and the resulting long-term stewardship implications. For example, due to the conditions listed above, it may not be feasible to clean up the Protected Area at RFETS to the standards required for unrestricted use. An alternative would be cleaning the Protected Area to a certain level and then constructing a cover system to control contaminant migration and minimize the threat of human exposure. Such a cover system would result in an area that is off-limits to people, vehicles, and construction, and would require long-term monitoring and maintenance costs. This remedy would certainly limit future uses and likely increase the long-term stewardship burden.

Land use drives risk management and risk management drives land use.

How people use a site is a major component in determining the risk from contamination. For example, if a parcel is planned to be a park, the analysis of risk would include planting of grass or construction of parking lots that could be a barrier between contamination and humans. Assumptions would be made about how often a person would come to the park, how active s/he would be in terms of coming in contact with soil and breathing, and how soil contaminants could potentially be transported to a person's body. A similar analysis for an office park would probably calculate risk based on a worker being there 45 hours per week, most of it inside, in contrast to the outside park use of only a few hours per week. These future use assumptions guide how much residual contamination will be considered acceptable. On the flip side, the level to which a site is cleaned up can limit the options for future use. If too much residual contamination is left, more intensive uses such as residential may not be considered safe while other uses would be considered acceptable. Thus land use drives risk management and risk management drives land use.

Site Configuration. Depending on the results of remediation, portions of the site may require ongoing access restrictions or access provisions. Protective caps will likely preclude construction in some areas. Remaining underground structures such as clean tunnels, foundations, or pipes, would affect the types of construction possible - e.g., a large building with deep footings could not be built over such infrastructure. Future uses of the Site will need to be configured in accordance with remaining structures.

Land Use Planning. It is useful to clarify the distinction between remediation planners' use of the "end-state" concept and the traditional "future use" approaches of local governments.

Beyond Closure

Local governments traditionally designate or zone land parcels based on planning and urban design concepts. Land use zoning categories have a specific description of the appropriate or desired uses and densities based on the nature of the site and its proximity to other uses. It is up to project proponents in concert with local government authorities to determine exactly how the land will be used after the land leaves federal ownership and under what conditions. For example, in most surrounding jurisdictions, the "open space" designation has specific meaning with associated terms and conditions.

Future use planning also recognizes the dynamic nature of land uses. While a parcel may be appropriate for one use today, the use could change in the future. Agricultural land has been urbanized rapidly in the 20th century; certainly the vast time span in which plutonium contamination could continue to pose environmental and human health risks gives rise to epochal rather than simply historical consideration of land uses.

In contrast, remediation planners for Rocky Flats focus on a single point in time at the conclusion of cleanup. The "end-state" defines exactly how the site will be left in terms of contamination, residual structures, ecological condition, and stewardship requirements. The end-state decision will enable a certain use or range of uses considered acceptable for the conditions, but it will not specify the actual future use(s). For example, the end-state for Rocky Flats is proposed to allow educational, industrial, office, recreational, or preservation uses. The cleanup decision will not include determination of which uses the community may choose over time. Section 4.2 discusses regulatory meanings of "interim" and "final" cleanup decisions that affect end-state conditions.

4.0 REGULATORY REQUIREMENTS AND TYPES OF AGREEMENTS

This section discusses the regulatory requirements that shape cleanup decisions and provides a window into the agreements between institutions that guide the implementation of those decisions. CERCLA regulations do not explicitly require the establishment of a long-term stewardship program. They do set expectations for EPA decisions in the ROD to use "treatment to address the principal threats posed by a site, wherever practicable" and "engineering controls, such as containment, for waste that poses a relatively low long-term

4.1 Regulatory Background and Requirements Related to Stewardship

The ultimate nature of the remediation actions at Rocky Flats will significantly affect the stewardship needs following cleanup. The statutes governing remediation allow substantial flexibility in selecting remediation approaches. The fundamental requirement is that the cleanup must "protect human health and the environment." Under CERCLA, EPA has quantified this standard (at least in part) by establishing acceptable levels of risk for cancer and non-cancer health effects[4]. CDPHE has a similar policy for cleanups conducted under the Colorado Hazardous Waste Act. These levels may be achieved through a variety of methods, such as:

- removing contaminants from the site and disposing of them elsewhere;

- treating them to reduce or eliminate their hazardous characteristics;
- disposing of them onsite;
- limiting exposure to the contaminants through some sort of physical, engineered or institutional control; or
- some combination of the above.

Under CERCLA, the selected remedy also must comply with Applicable or Relevant and Appropriate Requirements (ARARs). EPA is also required to consider reasonably anticipated future land uses in evaluating cleanup options. Alternatives that protect human health and the environment and meet ARARs are then compared on the basis of five balancing criteria:

- long-term effectiveness and permanence,
- reduction of toxicity, mobility, or volume through treatment,
- short-term effectiveness,
- ease of implementation, and
- cost.

Finally, EPA must also consider the state's and the community's views on the cleanup options. Comparisons of the options are compiled and a preferred alternative is selected.

In the preamble to the RFCA, CDPHE, EPA, and DOE agreed to general parameters to guide cleanup at RFETS. These general parameters are planning assumptions, not final decisions, to define the preferred direction toward the end-state condition. The RFCA preamble's key assumptions affecting future stewardship actions at RFETS are:

- Fissile materials and transuranic wastes will be shipped off-site;
- Some soils contamination will remain in place;
- Some contamination will be consolidated and covered with caps – see section 6.3;
- Some groundwater contamination will remain;
- Remaining contamination includes both chemical and radiological constituents; and
- Residual contamination levels will permit open space uses in the Buffer Zone and potential industrial uses in the south side of the industrial area.

As noted above, under CERCLA, remedies must not only meet the specified risk levels mentioned, they must also comply with "legally applicable" or "relevant and appropriate" requirements of other laws. Given the key assumptions described above, the following regulatory requirements will likely apply to remediation and stewardship decisions at RFETS:

- RCRA requires a minimum of 30 years of groundwater and cap monitoring for landfills;
- NRC radioactive waste regulations prohibit reliance on institutional controls for more than 100 years; additionally, caps must be designed for 1,000 years;
- Colorado Hazardous Waste Act requires a deed notice that hazardous waste has been disposed; and

- CERCLA requires that any deed transferring federal property for which cleanup has been completed contain a covenant that the United States will perform any additional response action subsequently found to be necessary.

4.2 "Interim" and "Final" Cleanup Decisions

Through agreements reached as part of the RFCA, remediation activities at Rocky Flats are currently being conducted as "interim" actions under CERCLA and CHWA. These accelerated actions allow steps to be taken prior to the final cleanup to reduce or eliminate the risks posed by the Site. These actions include removal or treatment of soil "hot spots," mitigation of surface or ground water contamination, and decontamination of buildings and structures.

In concert with community decision-making input, DOE, EPA, and CDPHE have prioritized remedial actions to address the higher risks first, to make the most of available funding. At the completion of these interim actions, final decision documents will be developed for the Industrial Area and Buffer Zone, which will:

- address the remaining contamination and risks posed by the Site,
- detail the appropriate remedial actions to mitigate those risks, and
- establish an implementing mechanism for those remaining actions.

The final decision document under RCRA is called a "Corrective Action Decision (CAD); the CERCLA decision document is a "Record of Decision." Because the processes for the CERCLA and RCRA decision documents are similar and are merged under RFCA, the following describes the CERCLA process, in brief.

Subsequent to the signing of the ROD, the remedies selected are designed and implemented. If additional information comes to light or the technology is proven ineffective, EPA can select a different remedial action. If the change is a fundamental difference from the selected remedy, EPA is required to repeat the public process. When all cleanup goals for the site have been met, EPA deletes the site from the National Priorities List.

Although the CAD/ROD represents a "final" decision in one sense, EPA is required to review the remedial action at least every five years if residual contamination is left on site, even after determining that the remedy is in place. There is no designated end-point to the five-year reviews, and CERCLA will not sunset unless the U. S. Congress amends it. If the review demonstrates that the remedy is not protective of human health and the environment, EPA can require additional remediation. Requirements of the remedy implementation and the long-term stewardship continue to be subject to the five-year review.

Many people have expressed the view that the decisions in the Rocky Flats CAD/ROD should not be considered final, and that if new technologies were developed that would enable greater (or complete) cleanup, they should be used. There is no statutory or regulatory requirement to perform additional cleanup simply because a new technology has been developed. However, in evaluating the continuing protectiveness of a remedy that uses engineering and/or institutional

controls, EPA could consider whether eliminating the need to rely on such controls in perpetuity would justify employing the new technology.

4.3 Post-Closure Responsibilities: Property Transfer Issues

Under RFCA, RCRA, CHWA, and CERCLA, DOE is liable for implementing the final remedy, including the required monitoring, controls, and operation and maintenance. DOE remains responsible for any response to threats associated with remaining Site hazards. This responsibility includes newly discovered DOE contamination above final action levels, unforeseen migration or failure of institutional controls or caps, and levels of contamination considered acceptable as reflected in the CAD/ROD, but which are subsequently determined to present higher risks than previously believed. DOE may contractually transfer responsibility for these things to a voluntary recipient, but ultimately if controls fail, the federal government is liable.

If DOE ownership continues, then DOE will retain the ability to control access, direct monitoring, and operation and maintenance activities. DOE's authority for the continuing actions would rest in its proprietary rights to the Site and would be reinforced through RFCA, as amended, and the settlement agreement implementing the CAD/ROD. In this case, DOE would retain complete responsibility and authority for the Site and continuing actions.

However, DOE has determined that Rocky Flats has no continuing DOE nuclear or non-nuclear production mission. If DOE chooses to relinquish some authority over the property, it will need to establish some mechanisms that ensure the continuation of the required monitoring, operation and maintenance, and use controls. RFCA and the settlement agreement implementing the CAD/ROD are binding on the parties to the RFCA and the agreement, but not necessarily to other parties. Thus, if DOE transferred the property and/or some authorities to another party, additional mechanisms may be required to ensure the remedy remains protective.

Under the terms of RFCA, DOE may not transfer any interest in real property at RFETS without providing for continued maintenance of any relevant response action, including containment and monitoring systems. Also, any new owner is subject to CERCLA, RCRA imminent hazard authority, and CHWA emergency authority, and perhaps CHWA post-closure permits. In addition, CERCLA requires DOE to covenant to perform additional remedial action as needed. (Any additional mechanisms to ensure an effective remedy could be contractual between DOE and the party purchasing land.) Also, a variety of institutional controls can be applied to property by a government entity. These are discussed in Section 4.0, with their strengths and limitations.

Regardless of the mechanisms selected, future funding becomes a critical factor in implementing remedies. If DOE ownership and active responsibility continues, annual funding must be obtained from DOE and Congress. Given the current difficulties with funding active cleanup, greater challenges are anticipated for funding long-term activities and controls. If DOE

relinquishes ownership or control of the property, obtaining continued funding could potentially become more difficult still.

At Superfund sites owned by the private sector, some regulations require financial assurance to guarantee adequate future funds to implement selected remedies. Responsible parties can purchase insurance policies payable to the regulator in the amount of estimated future cleanup costs, or in some cases, trusts can be established to provide an annual pay-out of the necessary ongoing costs or to satisfy a future lump sum amount. Neither of these mechanisms is directly applicable to a federal agency, but circumstances might allow some variation of these mechanisms to be viable.

5.0 INSTITUTIONAL CONTROLS AND GOVERNMENTAL POWERS

5.1 Overview of Institutional Controls

Institutional controls act by inhibiting future access to a site or by limiting exposures to hazardous substances that may remain on a site after closure, not by physical but by legal means.

Remediation of the Site is well underway. It is anticipated that the final remedial decision will probably not allow unrestricted use of all the land or groundwater at RFETS, as residual contamination in some places will likely exceed protective levels. Additionally, while no decisions have yet been made regarding future ownership of RFETS, it is possible that DOE could transfer ownership of some or all of the facility at some future point. Consequently, this section presents the various mechanisms that might be used to restrict future land uses – and thus protect users and the environment – at RFETS. Known as institutional controls, these mechanisms act by inhibiting future access to a site or by limiting exposures to CERCLA hazardous substances that may remain on a site after closure, not by physical but by legal means.

Institutional controls can generally be categorized as one of two types: governmental or proprietary. Government controls include zoning restrictions, permit programs, well-drilling restrictions, or other restrictions traditionally established through local governmental authority. Proprietary controls are legal devices, such as deed restrictions, easements, and restrictive covenants that are based on state property law to restrict the private use of property.

Given the long-lived nature of some hazardous substances and the expense to eliminate contamination at a site, it is not unusual to find that controlling public access or limiting the activities at the site are methods chosen to reduce the exposure to hazardous substances. CERCLA requires that all proposed remedial actions must evaluate whether the action will protect human health and the environment. Both institutional and physical controls may be included in the analysis. Where such controls are part of the remedial decision, the site is expected to demonstrate that they can reasonably be expected to be effective into the foreseeable future. As mentioned earlier, CERCLA requires a five-year review of remedial actions where hazardous substances may remain at the site. This review evaluates the

effectiveness of the remedy including whether the institutional controls are effective, have remained in place, and are being followed.

5.2 Types of Institutional Controls

A variety of institutional controls may be used, such as deed restrictions and adoption of land use controls by a local government. These controls can either prohibit certain kinds of site uses, or, at least, notify potential users of the presence of hazardous substances remaining on site at levels that are not protective for all uses. Such information can be used in the stewardship discussion to answer the questions: 'what type of institutional control should be used?' and 'what authority structure is appropriate to implement and enforce the institutional control?' A detailed discussion of the legal bases for institutional controls can be found in Appendix D.

If any remedial action will require a restricted land use, such as "limited open space," it is essential that the alternative include components that will ensure it remains protective. Institutional controls need to be included in the stewardship discussion as they can help to prevent an unanticipated change in land use, which might result in unacceptable exposures to residual contamination. In such cases, institutional controls will play a key role in ensuring long-term protectiveness.

For example, suppose an agreed-upon future land use is industrial. It may be possible that an industrial user would be allowed to conduct operations once the cleanup is complete, but low levels of hazardous substances are still present on site. Institutional controls would ensure the land is not used for other, less restricted purposes, such as residential use.

5.2.1 Enforcing Institutional Controls

Residual radioactive contamination will likely remain at RFETS for tens, if not hundreds, of millennia. Thus, the institutional controls at RFETS may need to remain in place essentially in perpetuity, and have strong mechanisms for enforcement associated with their implementation.

Enforceability has a number of dimensions. By definition, an institutional control was imposed because it was deemed necessary to ensure that the remedy protected human health and the environment. At RFETS, EPA and CDPHE are the two regulators making the decisions as to whether and how to require institutional controls as part of the cleanup. Therefore, EPA and CDPHE should be able to enforce institutional controls at RFETS. Perhaps DOE, as the owner and operator of RFETS, and as the lead agency under CERCLA, should also have enforcement authority. Whichever party fulfills this regulatory/enforcement role, it is a critical one.

The environmental regulator would be the only entity that could approve the termination or modification of any given control mechanism. As a corollary of the preceding point, use restrictions (institutional controls) should be terminated or modified only if such changes do not compromise the protectiveness of the original remedy. Proposed land use changes over time may cause greater human exposure to contamination than was assumed in establishing cleanup

levels. The environmental regulator is the only entity with sufficient and the combined expertise, authority, and mandate to evaluate whether the increased exposures are acceptable, or whether additional remediation is necessary.

The enforcement mechanism should include the ability to compel compliance with the use restrictions in the control, or such other injunctive relief as may be necessary to protect human health and the environment. Injunctive relief might be needed in cases where the use restrictions have already been violated, e.g., if someone had already built houses in an area that was limited to industrial or open space uses.

Land use changes may cause greater human exposure to contamination than was assumed in establishing cleanup levels.

Because an institutional control must be effective for as long as the residual wastes remain hazardous, the restriction must be enforceable against all successors in interest to the affected property. The restriction must also be enforceable against persons other than the landowner who propose to violate it. For example, the landowner may lease the property to another person who proposes to develop in a manner that conflicts with the use restriction.

It follows that subsequent owners and users of the property must be aware of the conditions limiting use that the control imposes. Recording the restriction with the county clerk's office is one mechanism to notify subsequent landowners; some other mechanism would be needed to ensure lessees received notice.

5.2.2 Land Use Restrictions

There are several types of land use restrictions in Colorado. Briefly discussed in this section are common law easements, statutory easements, covenants, and zoning. For more detail on these mechanisms, see Appendix D. Additionally, permits issued under the Colorado Hazardous Waste Act may, under certain circumstances, be used to implement institutional controls.

Common Law Easements. Except for certain specific easements created by statute (such as conservation easements, discussed below), easements and other private property restrictions like covenants are creatures of the common law (i.e., created and refined by judicial decisions over the years). The rules governing easements are sometimes confusing. In trying to understand these rules, it helps to remember that courts created many of them to help keep land marketable. Common law property restrictions therefore have limited effectiveness as institutional controls addressing protectiveness of the environment and public health.

An easement is an interest in property which either provides one owner the right to use another's property for a particular use, such as a driveway (affirmative easements), or restricts the use of owned land by, say, precluding a landowner from building a structure which might obstruct views from the easement holder's adjoining parcel (negative easements). Easements generally impose a burden on one parcel of land for the benefit of an adjoining parcel of land. There is a second kind of easement, called an easement in gross, which benefits the holder of

the easement personally, rather than an adjoining parcel of land. A utility easement is an example of an easement in gross.

An easement in gross used as an institutional control at Rocky Flats would restrict the use of the burdened land, and would probably be held by CDPHE (and/or EPA). Unfortunately, no Colorado legal cases discuss easements of this type, nor do courts in the United States generally recognize negative easements. Thus, there are serious legal concerns as to whether a Colorado court could enforce a "common law negative easement in gross" used as an institutional control. These issues could be addressed by creating a statutory hazardous waste easement, similar to the conservation easement discussed below.

Statutory Easements. The Colorado Legislature has the authority to create easements by statute. Colorado has six statutory easements addressing solar access, conservation, ditches, mining uses, public roads, and recreational trails. The statutes creating these easements define the purposes for which they may be created. None of these statutory easements would be effective as an institutional control at RFETS. A properly drafted statutory hazardous waste easement, modeled on the conservation easement, could meet the enforcement criteria described in Section 5.2.1.

Covenants. A covenant is an agreement or promise of two or more parties that something is done, will be done, or will not be done. The term covenant is often used to describe promises relating to real property that are created in conveyances or other instruments. Land use covenants create rights and duties between the original promising parties that may bind subsequent owners of the affected land.

There are a broad variety of covenant instruments, only some of which would meet the long-term (if not perpetual) needs of institutional controls at RFETS. One possible instrument would be an equitable restriction, which can be enforced through injunctions only, not through damages. If found to be legally viable, it could be set up between CDPHE and the landowner to bind the landowner's successors in interest (future purchasers or heirs to the property) by drafting and recording an equitable restriction that clearly expresses the intent to bind subsequent owners. This instrument, too, lacks Colorado case law indicating whether it is supportable in the long run.

Additionally, some courts have held covenants inapplicable if they conflict with a local zoning ordinance. There is no Colorado case law on this issue. A covenant used as an institutional control at RFETS would be part of a state agency action under the Colorado Hazardous Waste Act (and/or a federal action under CERCLA). A court might hold that such a covenant overrides a local zoning ordinance, and there is some precedent in this matter.

The bottom line is that the lack of Colorado case law concerning covenants (and equitable restrictions) suggests that their long-term effectiveness as institutional controls will be difficult to predict.

Zoning. Zoning is the primary method that local governments use to regulate land use within their jurisdiction. This paper does not discuss zoning in any detail, because to date it does not meet most of the criteria for an effective institutional control. The environmental regulator has no authority to make or enforce zoning decisions. Conversely, local government holds no authority or mandate to implement CERCLA or RCRA decisions as do state and federal regulators. Local governments' zoning decisions are typically based on considerations such as economic development impacts, tax consequences, compatibility with surrounding land uses, and community desires regarding pace and direction of growth.

However, the unusual nature of the long-term protection needs at RFETS may invite creative zoning and jurisdictional solutions from local governments, and (as it already has) prompt them to develop their own expertise to make better informed decisions. Zoning options may be important to explore in the stewardship discussion.

Orders and permits. Under CHWA, CDPHE holds the authority to issue orders against permit holders who violate the Act. If transferred land at RFETS is still a CHWA facility, it is still subject to CHWA permitting requirements. Thus, for regulated units (e.g., surface impoundments, waste piles, land treatment units, or landfills) that close in place, CDPHE could restrict land use as part of the post-closure permit. Indeed, CHWA regulations require a permitted owner or operator to record an instrument that notifies subsequent purchasers that the land use is restricted. CDPHE could also restrict land use at corrective action management units (CAMUs) that close in place, either through the permit or the corrective action order. Normally, post-closure permits are required for 30 years, but CDPHE has discretion to modify and extend the default 30-year post-closure period.

5.3 Planning Tools

The jurisdictions adjacent to Rocky Flats are a combination of full-service and home-rule municipalities, single purpose authorities, and two of the most populous counties in Colorado. Land use and community development planning are generally governed by highly sophisticated planning tools including Comprehensive Plans, Master Plans, Transportation Plans, Intergovernmental Agreements, and other governmental guidance documents. During the stewardship phase, adjacent governments may choose to incorporate portions of the Site into these planning tools, or create new ones addressing the unique needs related to RFETS.

Local governments, by virtue of proximity of their citizens and lands to RFETS, have some of the highest vested interests in the long-term community development relationship with the Site. In order to achieve community development goals on or adjacent to the Site, local governments may also exercise their powers in the following arenas during the stewardship phase: annexation, zoning, urban renewal authority, taxing powers, water and sewer infrastructure, public safety/police powers, road construction and maintenance, public health and environment powers, and public and archived records. However, local decisions cannot conflict with CHWA and CERCLA decisions by CDPHE or DOE/EPA.

6.0 ENGINEERING CONTROLS

Engineering controls are physical barriers constructed to prevent unacceptable exposure to remaining hazardous materials. Engineering controls are being used or are under consideration to isolate residual contamination in the Rocky Flats environment. All engineering controls must work properly until the source of contamination for which they are employed is removed, and in most cases well beyond that time frame. Some of the residual radioactive contamination at Rocky Flats will continue to be hazardous far beyond the life span of any engineering controls. Consequently, continued monitoring, oversight, replacement, and upgrading of engineering controls is needed to ensure their long-term effectiveness.

Examples of engineering controls used at radioactive and hazardous waste sites around the world include:

- Subsurface barriers
- Fences
- Containment (RCRA or equivalent caps/barriers)

6.1 Subsurface Barriers

The two main types of subsurface barriers are slurry walls and passive treatment walls.

Slurry walls are underground barriers that isolate contaminated ground water plumes from surrounding groundwater flow systems. They are constructed by filling a trench with a mixture of bentonite (clay) and soil, which creates a barrier between contaminated and uncontaminated ground water flows. Quality control measures guide the appropriate percentages of soil and bentonite to ensure a barrier maintains its impermeability. Permeability tests ensure the contaminants do not have properties that would dissolve the bentonite and affect the quality of the barrier.

Slurry walls are quick and cost-effective systems to install. These barriers are designed for about a 30-year life expectancy, at which time they may have to be re-evaluated and repaired or replaced to ensure their integrity remains intact.

Passive treatment walls direct contaminated ground water through a treatment system before allowing the water to mix with uncontaminated ground water flows. A permeable reaction wall is installed across the flow path of a contaminant plume. A porous media made of iron filings is typically used in the reaction wall as a catalyst. The iron reacts with the chemicals to destroy the hazardous constituents, which yields a non-hazardous compound safe to discharge to surface water drainages. The iron must be replaced and replenished periodically. At the end of its useful life, the iron can be recycled. This type of treatment system is about one-fourth the operating cost of pump-and-treat systems. Most of the savings result from low system-maintenance requirements.

Passive treatment wall technology is currently being used at Rocky Flats to treat a contaminated groundwater plume from the Mound, a former waste drum burial area.

6.2 Fences

Fences can help prevent humans and animals from gaining access to a controlled area. Various designs can be used, depending on the type of material to be protected. Fences can vary in height, material, and depth and spacing of fence posts. Also, combinations of fence types can be used, such as barbed wire combined with a chain link fence. Warning signs enhance a fence's effectiveness to deter human entry to an area. Fences can prevent access to areas that must be protected over the short term, and are relatively inexpensive to install. They require periodic maintenance and will degrade over time if not maintained. However, fencing generally needs to be used in tandem with other control measures.

6.3 Containment: Caps

Caps as a type of containment technology involve leaving potential contaminant sources in place and controlling the processes that cause the contamination to migrate. Control of migration can be achieved with natural or synthetic barriers that are placed around the contaminated material to control the movement of air and water through and around it. Migration barriers are either permeable or impermeable depending on the type of contaminant and transport mode. Long-term surveillance and maintenance is typically required to protect the system's integrity (depending on design and construction type) until the waste is no longer a hazard.

A cap placed over residual contamination is a central feature of most containment strategies and can range from a very simple soil cover to a very complex engineered design intended to direct both the vertical and lateral flow of water. A cap can also be used as a barrier to prevent human physical contact with the contamination.

Under ideal conditions, the primary functions of the cap are to isolate the buried contamination from the surface environment and control hydrologic processes, including infiltration and erosion that can cause contaminant migration from the site. Excessive erosion of cap soils can expose buried contamination, leading to the potential for off-site contaminant transport. Likewise, water that infiltrates into the cap soils can lead to contaminant leaching from the burial environment. The use of vegetative covers can enhance cap performance by causing evapotranspiration of rainfall from cap soils before it can infiltrate into the contaminated soil. This technique is particularly effective in arid and semi-arid climates. Plant root and burrowing animal intrusion into the contaminated soil can also affect cap integrity, impacting contaminant migration.

Caps are being considered as part of final closure for RFETS over the former Solar Evaporation Ponds and portions of the land under former Pu-production buildings in order to minimize the potential for migration of residual contamination remaining in the subsurface environment. The reason for selecting a cap as part of the final remedy would be derived from an analysis of the site-specific conditions and the criteria in CERCLA which deal with factors such as technical feasibility, risk, and cost. The Solar Evaporation Ponds and the former Pu-production areas are

likely candidates for caps because complete removal of all contamination in the areas may not be feasible. The ultimate decision will require two criteria to be met. First, the final condition must be protective of future users of the Site. Second, it must be protective of surface water.

Recent advances in the design of covers in semi-arid areas such as Rocky Flats have shown that caps can be designed so that all surface precipitation will evapotranspirate within the first 18 to 24 inches of an engineered cover. This means that placement of a final cover will eliminate the potential for 95+ percent of surface precipitation to percolate through the waste. Any cap capable of preventing infiltration is very likely to protect future users from radiation doses on the site as well.

6.4 Natural Attenuation

While not technically an engineering control, natural attenuation can be a solution when there is no immediate threat of exposure from the contamination in question, and when it is determined that, with time, natural processes will decrease contaminant concentrations to acceptable levels. This remedy is not commonly an effective solution for long-lived radionuclides. Monitoring the extent, nature, and location of soil, air, and water contaminant concentrations over time is a key element of implementation of attenuation strategies, as is communication of the presence of radionuclide contamination.

7.0 INFORMATION REQUIREMENTS

7.1 Background

Stewardship data includes information about past and present conditions and activities at RFETS necessary to ensure continued protection of human health and the environment. This includes information generated prior to and during cleanup as well as during long-term operations and monitoring. Because long-term stewardship is an emerging issue, it is currently unclear whether existing information storage practices will be adequate to support future long-term stewardship activities.

An important first step in developing the Rocky Flats stewardship information program is to evaluate the value of all records being created currently and ensure that those with stewardship value are saved and stored for future use. Next, the information needs to be stored in a format that is easy to access and retrieve. The Joint Records Management Strategy for Site Closure (issued by Kaiser-Hill in 1998) is the current records management strategy for existing and future information. Implementation of this strategy will be an ongoing process.

Information related to stewardship exists in a wide variety of forms and varies in use, user, accessibility, and detail. These concepts are examined in the following sections.

7.2 Types of Information That Need to Be Preserved

Implementation of stewardship activities for the Site may be transferred to entities other than DOE. Future stewards, as well as primary and external data users, will need sufficient information about the Site to ensure the continued protection of human health and the environment. Though the specific structure and contents of an information storage system are not yet completely defined, certain types of information must be kept current and readily available to both stewards and stakeholders. The information needs to be clear and concise, with the proper scope and depth to fulfill stewardship requirements; it can be organized by categories such as site conditions at closure, historical data, and ongoing information.

7.2.1 Site Conditions

Site stewards will need accurate information about site conditions (a stewardship baseline), timely access to relevant past records, and information about the legal and regulatory framework governing site activities as well as requirements established in site closure/transfer agreements. The information will need to be organized in a usable form for developing a stewardship program. Specific information needs likely will include:

- **Detailed information** on residual contamination, inherent risks, monitoring locations, monitoring results, existing hazards (location, type, and the likelihood to migrate or otherwise move within the Site or off-Site), and vulnerability to fire, rain, earthquakes or wind.
- **Site maps** indicating habitat and tallgrass prairies, wetlands/watersheds of both Woman and Walnut Creeks, underground contamination locations, building and infrastructure locations, contaminated groundwater, contamination plumes, monitoring wells (current and abandoned), air monitoring stations, stream monitoring points, pond locations, caps, old landfills, and resources (mining interests).
- **General information** including: description, location, size, acquisition cost and nature of real estate proposed for disposition; brief history; effects upon severance, mineral and other rights; impact upon the natural resource conservation program of the installation; existence of facilities of cultural or historical significance; and any other relevant information which explains any onsite disposal action.

7.2.2 Historical Data

Records of Site facilities and infrastructure, and historic activities need to be preserved, not destroyed, when facilities are demolished, infrastructure is declared obsolete, or site closure is accomplished. Specific historic information needs will likely include:

- **Disposition of historical hazards** that existed, were removed or otherwise mitigated to a point that allows unrestricted future uses, including legal or other supporting documents that the hazards are no longer present.
- **Environmental impacts records** as well as appropriate information about nuclear weapons production processes (e.g., locations and composition of production wastes).

- **Past and present releases and accidents**, radioactive and chemical contaminants or materials released during events, who or what was known or suspected to be exposed to these contaminants, and documented or suspected exposure levels.

7.2.3 Ongoing

Agreements will record stewardship roles and identify tasks that the stewards must perform from physical collection and analysis of samples to recording and maintenance of property deeds. The agreement will specify the frequency and duration of monitoring, and designation of responsible party for upholding the institutional controls.

When remediation activities are completed, some uncertainties may exist about both present day and long-term hazards. Present regulations and closure decisions are based on current assumptions about the hazards of and exposure to contaminants. Over time, data will be collected to provide more accurate assessments of contamination, risks, and remedial technologies and to monitor the effectiveness of the closure mechanisms used at the site. Provisions must be made for access to this information and any data generated by stewardship activities. Systems must be implemented and maintained to ensure continuous availability.

7.3 Information Preservation and Storage

The manner in which information significant to stewardship activities is preserved will become increasingly important in the years following Site closure. Data can be stored in different types of formats and repositories that best suit the needs of specific users.

Planners and land use decision-makers need to understand restrictions on the various portions of the Site. This information could be preserved in a form as simple as a map with specific delineation of restrictions (e.g., no digging, no residential development). Future site users will need to access more detailed information about Site restrictions in order to operate successfully within those constraints, such as past environmental sampling results, perhaps on a more detailed map. From this, they can make decisions about where soil disturbance would be acceptable and determine appropriate precautions.

Along with the historical data, those involved in land use at the Site will also need ongoing monitoring results. Meaningful interpretation of this data over very long periods of time will require an ongoing, readily accessible database to measure a remedy's effectiveness over time, updated as both database systems and our language changes.

In the future, much of the data collected during Site closure will likely be used for specific project needs in addition to routine reviews. Historians and health studies researchers will need to access the information in an organized, retrievable manner. Such a repository could be structured similar to the CERCLA Administrative Record or a historical preservation archive. Information preservation mechanisms will probably be diverse, requiring heightened interactivity and interconnectedness. Information updates should be distributed across a range of repositories. No consensus has been reached nationally as to the safest, most reliable means

for data storage. Electronic systems are suspect due to frequent obsolescence, and hard copy records can be voluminous and unwieldy. Any mechanism used will require updating, maintenance, and possibly periodic replacement. The responsibilities for funding and implementing these actions are as yet unresolved.

At all sites with radionuclide contamination attention must be given to very long-term communication needs and responsibilities.

8.0 KEY STEWARDSHIP IMPLICATIONS OF FUTURE USE DECISIONS

A series of decisions are "on the books" for Rocky Flats, driven by environmental legislation including the Endangered Species Act, the Clean Water Act, the National Environmental Policy Act, and so on. This table generally outlines the types of decisions to be made during the closure project, their stewardship implications, and (as best we know) the time frames for those decisions. Refer to Appendix B for a graphic timeline of key decision-making opportunities. Appendix E provides detail on the disposition of DOE's real property at the Site, and on NEPA compliance issues.

Activity & Related Law Or Regulation	Begin Planning	Stewardship Implications
Implement Preble's Habitat Conservation Plan & Endangered Species Act (ESA)	FY1999	These requirements may limit or direct remedial actions, and therefore influence long-term activities at the site. Protective measures to preserve mouse habitat may include restrictions to access or development and prescribed maintenance and monitoring activities, such as weed control, to preserve habitat. DOE may be required to preserve or restore habitat as land manager or to ensure this upon land transfer.
Close Wastewater Treatment Plant (B995) Clean Water Act (CWA)	2 years before closure to develop options & implement preferred option	Closure of the sewage treatment plant will eliminate point source discharges at the site, and the need for a NPDES permit. Site water quality requirements will derive from regulatory agreements related to cleanup, which may be spelled out in the final CAD/ROD or other decisions under RFCA.
Pond Operations Changes CWA, RFCA Pond Operations Plan (POP)	Ongoing	By closure, management of the pond system must be addressed through some long-term mechanism, or have been changed to require no ongoing management or maintenance. Pond remediation may include measures to protect wetlands, preserve riparian zones, and assure discharged water quality.
Selection of Cap Material (RFCA, ESA)	FY2006	Cap selection is attended by requirements for maintenance and monitoring that will extend through the life of the hazard the cap contains, affecting the type and frequency of monitoring and repair or replacement required.
Coordination w/ watershed group monitoring, etc. (RFCA, CWA)	FY1998	If any residual contamination is left onsite following closure, monitoring will be required to demonstrate the effectiveness of management or mitigation activities. Surface water will be a key pathway/receptor for evaluation. Should pacts result from coordination with surrounding local government entities on watershed issues, the pacts might contain requirements that would become part of stewardship.
Post Closure Operations to Implement Final ROD (RFCA, RCRA)	estimated 2004	Any remedial activities remaining at closure will need mechanisms to guarantee their proper implementation. This includes direct actions, maintenance, monitoring and oversight to protect human health and the environment.
Specific reuse determinations (NEPA)	2 to 4 years before closure	Specific reuse decisions would affect not only stewardship requirements but cleanup level decisions.
Decontamination and removal of buildings and infrastructure/ Industrial Area Remediation	FY1999	Cleanup levels for under-building contamination will affect the disposition process. There exists the potential for in-place containment of environmental contaminants, which in turn may place limits on future use due to physical controls.

9.0 CONCLUSION

When we ponder the mysteries of the distant past of Çatal Huyuk, and wonder just what the messages inscribed on their ancient stones could mean, our health and safety is not threatened. To assure that humans in a similar situation in the distant future are not cursing their ancestors for leaving poisoned lands unprotected, we advocate strong and responsible stewardship of Rocky Flats now.

Stewards can and should come from all walks of life and their contributions can be coordinated through the community reuse organization – the Rocky Flats Coalition of Local Governments, the CAB, and through the public involvement mechanisms in RFCA. DOE needs to participate in the stewardship dialogue as the principal steward, but not to influence or appear to influence the outcome. Stewardship decisions and actions need to be visible and understood by the community at large, with lines of responsibility clearly drawn, and they should be reflective of the ethics and moral commitments of the community.

Documents related to stewardship will need to be revisited every so often, to continually re-evaluate the basis of each decision.

The Dialogue Planning Group deliberately refrained from defining how stewardship decisions should be made and by whom. Rather, we call for a commitment to ensuring that a well-informed and sound long-term stewardship of Rocky Flats is put in place, from those interested whether by virtue of profession, proximity, or passion.

APPENDIX A: Stewardship Dialogue Planning Group Participants

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Steve Livingstone	Department of Energy Headquarters, EM-24
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APPENDIX B: Time Line

(Refer to figure “Rocky Flats Opportunities for Future Use and End State Planning, next page.)

APPENDIX C: Glossary

Commonly Used Acronyms, Abbreviations, and Terms

Action Level Framework: a RFCA-based set of consensus interim numeric cleanup standards and levels developed by state and federal regulators, DOE, and Kaiser-Hill for RFETS.

Americium: A white metallic transuranic element of the actinide series, having isotopes with mass numbers from 237 to 246. Its longest-lived isotopes, Am 241 & Am243, are alpha ray emitters used as radiation sources in research.

ARARs: Applicable or Relevant and Appropriate Regulations.

Background: the level of radioactive or hazardous substance occurring naturally in the environment.

Buffer Zone: the roughly 6,100 acres at Rocky Flats that is unoccupied by buildings or development, providing a safety and security buffer. It surrounds the Industrial Area and the EPA regulates its cleanup.

CAB: (Rocky Flats) Citizens Advisory Board

CAD/ROD: Corrective Action Decision/Record of Decision *need explanation*

CAMU: Corrective Action Management Unit (storage vessels or units for low-level waste)

CDPHE: Colorado Department of Public Health and Environment

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act, commonly known as Superfund. This federal law passed in 1980 authorizing identification and cleanup of the nation's most seriously contaminated areas.

CHWA: Colorado Hazardous Waste Act

DOE: United States Department of Energy

Deactivation: the process of removing equipment and furnishings and cleaning remaining surfaces to prepare for Commissioning.

Decontamination: removal or reduction of radioactive or hazardous contamination from facilities, equipment, or soil by washing, heating, chemicals, etc.

Decommissioning: the process of removing tanks, ductwork, electrical wiring, and other building components.

Disposal: permanent removal from the human environment.
Disposition: transfer of control of waste, buildings, personal property, or materials to its long-term custodian.

EPA: United States Environmental Protection Agency, the federal agency responsible for enforcing federal laws protecting the environment.

FSUWG: Future Site Use Working Group (for Rocky Flats)

Half-life: the amount of time it takes for half of a radioactive element to decay into another, not
necessarily stable, form.

Hazardous waste: waste material that is listed as hazardous by a regulatory agency or is toxic, corrosive, ignitable or reactive.

Industrial area: the roughly 350 acres at the center of Rocky Flats where most of the weapons production took place. It contains 400 structures plus infrastructure such as electrical, water, and wastewater systems. Its cleanup is regulated by CDPHE through the RFCA.

Injunctive Relief: A court order requiring a person or entity to perform some aciton, or prohibiting them from performing an action.

IAG: the Interagency Agreement, formed in 1989 between DOE, CDPHE, and EPA for the Rocky Flats cleanup

Low-level waste (LLW): radioactive waste that is not spent nuclear fuel, by-product material, Transuranic waste, or high-level waste. It exists in many forms such as rags, paper, plastic, glassware, filters, soil and building rubble at Rocky Flats.

Milestones: tasks with a deadline.

Mixed waste: waste that is both radioactive and hazardous.

NPL: the National Priorities List, the EPA's official list of hazardous waste sites nationwide to be cleaned up under CERCLA.

Near term: 8 to 15 years.

NPL: National Priorities List ("Superfund")

Plutonium ("Pu"): a man-made silvery metal that is two times denser than lead, has 15 known isotopes with masses ranging from 232 to 246, and emits alpha radiation. Plutonium is used almost exclusively for nuclear fuels and nuclear weapons. It is "pyrophoric" or spontaneously combustible: the chemical reaction in Pu itself supplies enough heat to start a fire spontaneously

without a flame or spark; it can burn when exposed to oxygen. It is also toxic and fissile. Plutonium 239, which comprises most of Rocky Flats' Pu, has a half-life of 24,360 years. To understand half-life, note that if you had 10 grams of Pu-239 today, in 24,360 years you would have 5 grams and the rest would have decayed to other products. So it's only half gone in one half-life. If you waited another 24,360 years, you would have 2.5 grams, and so on. So to calculate how much you have for any given number of half-lives it would be 0.5^n, where n is the number of half-lives.

Regulators: U.S. Environmental Protection Agency, Colorado Dept. of Public Health and Environment, and the Defense Nuclear Facilities Safety Board.

RCRA: Resource Conservation & Recovery Act

RFCA: Rocky Flats Cleanup Agreement

RFETS: Rocky Flats Environmental Technology Site, also referred to as the Site.

RFLII: Rocky Flats Local Impacts Initiative

Settlement Agreement:

Special nuclear material (SNM): plutonium, plutonium-uranium combinations, and enriched uranium; highly radioactive materials used for nuclear weapons.

Stakeholder: a member of the public or an organization who has an interest or "stake" in an outcome.

Storage: operations that are designed to provide isolation and easy recovery of hazardous or radioactive material, and which rely on continuous human monitoring, maintenance, and protection from human intrusion. Superfund: the Comprehensive Environmental Response, Compensation, and Liability Act; see CERCLA above.

SWEIS: Site Wide Environmental Impact Statement

Transuranic (TRU) waste: radioactive waste that is contaminated with elements heavier than uranium (atomic weight of 92), such as plutonium and americium.

Uranium: A heavy silvery-white metallic element, radioactive, easily oxidized, and having 14 known isotopes of which U238 is the most abundant in nature. It is used in research, medicine, nuclear fuels, and atomic weapons.

Use Restrictions: A restriction placed on a section of remediated land that has been cleaned to "Open Space Use" levels, but not to be permitted for residential use.

WIPP: Waste Isolation Pilot Plant (Carlsbad, New Mexico). Long-term storage site for nuclear waste.

Sources:

http://www.rfets.gov/PublicItems/General/ACRONYMS.HTM

APPENDIX D:
A Detailed Discussion of Institutional Controls From a Legal Perspective

This appendix discusses in detail the types of land use restrictions that are under consideration for use as institutional controls in light of their legal strengths and weaknesses.

There are several types of land use restrictions in Colorado. They include common law easements, statutory easements, covenants and zoning. Additionally, permits issued under the Colorado Hazardous Waste Act may, under certain circumstances, be used to implement institutional controls.

Common Law Easements. Except for certain specific easements created by statute (such as conservation easements, see below) easements and other private property restrictions like covenants are creatures of the common law (i.e., created and refined by judicial decisions over the years). The rules governing easements are sometimes confusing. In trying to understand these rules, it helps to remember that courts created many of them to help keep land marketable, and to limit the influence of the hand beyond the grave. As discussed below, these rules limit the effectiveness of common law property restrictions as institutional controls.

An easement is an interest in property. Typically, the holder of an easement has the right to use another's property for a particular use, such as a driveway. This type of easement is known as an affirmative easement. In some cases, easements restrict the use that the landowner may make of his land. Such easements are known as negative easements. For example, a negative easement might preclude the landowner from building any structures on a portion of his land in order to preserve views from the easement holder's adjoining parcel.

Easements generally impose a burden on one parcel of land for the benefit of an adjoining parcel of land. Such easements are called appurtenant. However, there is another type of easement, known as an easement in gross, that benefits the holder of the easement personally, rather than an adjoining parcel of land. A utility easement is an example of an easement in gross.

An easement used as an institutional control would restrict the use of the burdened land, so it would be a negative easement. It would also be an easement in gross, because it would benefit CDPHE (and/or EPA), not an adjoining parcel of land. Unfortunately, no Colorado cases discuss negative easements. One respected property law scholar has stated that "Courts in the United States seldom recognize negative easements." Thus, it remains to be seen whether a Colorado court would be willing to enforce a common law negative easement used as an institutional control.

The few Colorado court decisions that mention easements in gross do not discuss their limitations. The Colorado General Assembly apparently believed that Colorado courts had not recognized easements in gross when it created statutory conservation easements in 1976. "The

general assembly finds and declares that it is in the public interest to define conservation easements in gross, since such easements have not been defined by the judiciary." ß†38-30.5-101, C.R.S. (1998). Courts in other states have held that easements in gross do not run with the land, i.e., they are not enforceable against subsequent owners of the burdened parcel of land. The Colorado Legislature's expression of its understanding of common law easements, together with the case law from other states, again raise questions as to whether a Colorado court would enforce a common law easement in gross used as an institutional control.

In addition, CDPHE (or CDPHE and EPA) would need to hold the easement to enforce it. There is some question as to whether CDPHE has the statutory authority to hold such an easement, and it appears that under CERCLA, EPA only has authority to hold property that is necessary to conduct a remedial action temporarily, until it can be transferred to the state.

Thus, under Colorado law, there are serious uncertainties regarding the effectiveness of easements as institutional controls. These issues could be addressed by creating a statutory hazardous waste easement, similar to the conservation easement discussed below.

Statutory Easements. The Legislature has the authority to create easements by statute. Colorado has six statutory easements: solar easements, conservation easements, ditch easements, mining easements, public road easements, and recreational trail easements. The statutes creating these easements define the purposes for which they may be created. None of these statutory easements may be established for the purpose of protecting human health and the environment by limiting exposure to contamination or by preserving an engineered element of a remedy. Consequently, their effectiveness as institutional controls is quite limited.

However, the statute creating the conservation easement does provide a good model for a hazardous waste easement. See ß†38-30.5-101, C.R.S. For example, it specifies that a conservation easement is an interest in land, notwithstanding it may be negative in character. It also specifies an enforcement mechanism. Proper drafting would ensure that a statutory hazardous waste easement met the enforcement criteria described above.

Covenants. A covenant is an agreement or promise of two or more parties that something is done, will be done, or will not be done. The term covenant is often used to describe promises relating to real property that are created in conveyances or other instruments. Land use covenants create rights and duties between the original promising parties that may bind subsequent owners of the affected land.

Covenants may be personal or real. Personal covenants operate like a general contract provision and bind only the parties to the covenant. Real covenants run with the land and burden or benefit successors in interest. A covenant is not an interest in land.

In most cases, institutional controls at RFETS will be long-term, if not perpetual. Thus, only real covenants will suffice as institutional controls. To create a real covenant that runs with the land and thus binds successors, the covenant must touch and concern the land and the parties must intend it to run with the land. Whether a covenant runs with the land and thus burdens

and benefits successors depends on the construction of relevant documents. To touch and concern land, the covenant "must closely relate to the land, its use, or its enjoyment." Courts sometimes impose a third requirement for a covenant to run with the land -- that the successor to the burden must have notice of the covenant.

A fourth requirement also may be necessary to create a covenant that runs with the land: privity of estate. Privity of estate describes common interests in the land that a covenant burdens or benefits. There are three types of privity of estate according to one property scholar:

- **mutual, or simultaneous** (e.g., between landlords and tenants, or between easement holders and owners of servient estates);
- **horizontal** (created only when the original covenanting parties make the covenant at the same time one conveys a fee estate in property to the other); and
- **vertical** (e.g., successors to the original benefited or burdened estate). Some courts have required some type of privity for covenants to burden successors in interest.

Two Colorado cases refer to the "requisite" privity of estate for covenants to run with the land, instead of being only personal. "The requisite privity exists in the case of a covenant by a grantor to do or not to do something on land retained by him, adjoining that conveyed, so that one to whom the former is subsequently conveyed by him may be bound by the covenant." The grantor and grantee of an easement had "requisite privity." Neither case discusses specifically what comprises the necessary privity.

CDPHE is not likely to possess any of the types of privity of estate noted above, so if privity is required for a covenant to run with the land, covenants would not be effective as institutional controls. However, courts in many states have avoided some of the technical requirements necessary for a covenant to run with the land by recognizing another type of restriction called an equitable restriction, or equitable servitude. Equitable restrictions may be enforced through injunctions only, not through damages. No courts require privity of estate for equitable restrictions. An equitable restriction would probably make an acceptable institutional control, because CDPHE is more concerned with enforcing the terms of the restriction than with obtaining damages. If privity of estate is not necessary for equitable restrictions, then CDPHE and the landowner could bind the landowner's successors in interest by drafting and recording an equitable restriction that clearly expresses the intent to bind subsequent owners. Unfortunately, there is no Colorado case law regarding equitable restrictions, so we simply don't know if a Colorado court would follow the general rule. The lack of case law casts significant uncertainty on using restrictive covenants as institutional controls at RFETS.

Section 38-41-119, C.R.S., poses another impediment to using covenants as institutional controls. It provides:

> No action shall be commenced or maintained to enforce the terms of any building restriction concerning real property or to compel the removal of any building or improvement on land because of the violation of any terms of any building restriction

> unless said action is commenced within one year from the date of the violation for which the action is sought to be brought or maintained.

This may not be a significant problem at Rocky Flats in the short term, because it is such a high-profile site and it is not terribly far from CDPHE's offices. In the long run, however, it could become a problem. Because covenants are not interests in property, questions about CDPHE's ability to take title to property does would not be an issue. Covenants are contractual in nature, and CDPHE does have the authority to enter into contracts.

Finally, some courts have held covenants inapplicable if they conflict with a local zoning ordinance. There is no Colorado case law on this issue. If Colorado courts followed the Restatement rule, a local zoning action could vitiate the institutional control. However, the Restatement rule involves private covenants between private parties, not covenants involving a regulatory agency. A covenant used as an institutional control at RFETS would be part of a state agency action under the Colorado Hazardous Waste Act (and/or a federal action under CERCLA). A court might hold that such a covenant overrides a local zoning ordinance. In a related situation, the U.S. Court of Appeals for the Tenth Circuit held that an EPA-selected remedy under CERCLA pre-empted a Denver zoning ordinance prohibiting maintenance of hazardous wastes in areas zoned for industrial use.

The bottom line is that the lack of Colorado case law concerning covenants (and equitable restrictions) makes predicting their effectiveness as institutional controls difficult.

Zoning. Zoning is the primary method that local governments use to regulate land use within their jurisdiction. This memo does not discuss zoning in any detail, because it does not meet most of the criteria for an effective institutional control. The environmental regulator has no authority to make or enforce zoning decisions. Those decisions are made by the local government, which does not have the same expertise, authority or mandate to protect human health or the environment. Instead, local governments base their zoning decisions on a completely different set of considerations, including economic development impacts, tax consequences, compatibility with surrounding land uses, community desires regarding pace and direction of growth, etc.

CHWA orders and permits. Under the CHWA, CDPHE may issue orders to owners and operators of hazardous waste treatment, storage or disposal facilities, as well as to generators and transporters of hazardous wastes, in cases where the person has violated some requirement of the Act. CDPHE may also require permits for owners and operators of hazardous waste treatment, storage or disposal facilities.

At RFETS, institutional controls would be necessary for long periods of time, so they would need to be enforced against subsequent owners. If the transferred land is still a CHWA facility, it is still subject to CHWA permitting requirements. Thus, for regulated units (i.e., surface impoundments, waste piles, land treatment units, or landfills) that close in place, the Division could restrict land use as part of the post-closure permit. Indeed, CHWA regulations require the owner or operator to record an instrument that notifies subsequent purchasers the land use is

restricted. The Division could also restrict land use at corrective action management units (CAMUs) that close in place, either through the permit or the corrective action order. Normally, post-closure permits are required for 30 years, but the Division has discretion to modify the default 30-year post-closure period.

Thus, the CHWA permit could serve as an effective institutional control for closed regulated units and CAMUs. If there are no closed regulated units or CAMUs, CDPHE's authority to require a permit is less clear.

APPENDIX E:
DOE's National Environmental Policy Act and Real Estate Decisions at Rocky Flats

Once the DOE decides that a real property asset no longer supports a site mission, then the disposition process can be initiated. The RFFO Realty Officer's approval is required prior to final disposition decisions for RFETS real property. In this process, once end-state options are defined and the CERCLA or NEPA decisions are issued, then the disposition process can be followed, including demolition and transfers to other entities. The level of National Environmental Policy Act review required will be determined by the proposed specific reuse of the land. The RFFO estimates that the process for an action regarding disposition of RFETS real property could take approximately 3 years if an environmental impact statement is required. This process could start in 2002 or earlier. RFETS assumes that land transfer will occur at or after closure.

Actions requiring facility decommissioning and environmental remediation are presently being conducted under RFCA, which requires specific decision documents to be provided for public comment and regulatory approval. NEPA values are incorporated into these decision documents and the associated administrative record. Public review and comment provisions provide the functional equivalent of the traditional NEPA process. Actions that may be outside of the regulatory scope of RFCA (e.g., transfer of real property and construction of new facilities) will undergo separate NEPA analyses. In addition, there may also be some activities under RFCA that may require separate NEPA analyses. RFETS will ensure that the appropriate level of NEPA coverage is prepared prior to any decommissioning of real property.

Generally, the building disposition process must be started one year before the start of decommissioning for buildings. The process must be started two years ahead of a potential start of decommissioning for buildings that may ultimately be made available for reuse by other than DOE. If, after the RFCA-required decommissioning process is completed (if it is required), and no response is received on reuse of any facility/building, then the real property disposition process would continue. In 1998, the Rocky Flats Industrial Area Transition Task Force found no compelling reason for facility reuse and recommended that all buildings and infrastructure be removed as part of the closure project.

However, during the remediation process, some building operations will continue, for example:

- managing the disposal of excess chemicals or equipment,
- performing surveillance and maintenance,
- providing risk reduction from Site hazards to the worker, the public, and the environment
- closure of RCRA units, and
- the collection, packaging, storage, and shipment of wastes stored in a building or generated when it is being dismantled may also occur.

Beyond Closure

Because some buildings are needed to support disposition activities in other buildings, they continue to have a mission and may continue to operate until the buildings they support complete the disposition process.

End Notes

[1] From "Stakeholder Report on Stewardship," Oak Ridge Reservation End Use Working Group, Stewardship Committee. July 1998.
[2] Ibid.
[3] See "Moving from Cleanup to Stewardship" by U.S. Department of Energy, Environmental Management Program, Office of Strategic Planning and Analysis, Sept. 17, 1997. Also see "Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant," for Kathleen Trauth, Stephen C. Hora, Robert V. Guzowski, prepared by Sandia National Laboratories for the U.S. Department of Energy, SAND92-1382, November 1993.
[4] A full discussion of these risk levels is beyond the scope of this paper, but the essence of the CERCLA risk management policy is that exposure to contaminants remaining at a CERCLA site after cleanup should not result in more than one in ten thousand "excess" cancers.